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TITLE: Method and apparatus for conditioning insufflation gas for laparoscopic surgery

DWKU:

**5411474**

BSPR:

The present invention provides an apparatus for treating gas prior to the use of the gas in a medical procedure involving a patient, the gas being received into the apparatus from an insufflator which receives gas from a gas source, and the gas exiting the apparatus being in flow communication with a means for delivering the gas to the interior of the patient, wherein the gas is pressure- and **volumetric** flow rate-controlled by the insufflator, comprising a housing having an inlet and an outlet; means for communicating the outlet of the insufflator with the inlet of the housing; a chamber within the housing and having an entry port and an exit port, the entry port of the chamber being in flow communication with the inlet of the housing; a humidification means in the chamber that is in the path of travel of the gas through the chamber; heating means disposed within the humidification means for heating the gas to a predetermined temperature; means in the housing adjacent the exit port of the chamber for sensing the temperature of the gas; and means connected to the sensing means for controlling the heating means, whereby upon the determination by the sensing means of the temperature of the gas being at a predetermined level, the controlling means regulates the amount of heat applied by the heating means to the gas within the chamber. Additionally provided is a source of power for the controlling means. Also provided is the above apparatus

wherein the source of power is a battery.

BSPR:

Another object of the invention is to provide an apparatus having a chamber having a high efficiency humidification bed and that simultaneously provides a filtration for the gas, wherein also the heating means is disposed within the humidification means. Accordingly, the apparatus of the present invention provides for heating and humidifying gas for use in a medical procedure, comprising a chamber having an entry port and an exit port; humidification means within the chamber that is in the path of travel of the gas through the chamber; and means disposed within the humidification means for heating the gas to a predetermined temperature. The humidification means can comprise a volume of water and have the heating means disposed within or around the water.

DEPR:

The present invention provides an apparatus for treating gas prior to the use of the gas in a medical procedure involving a patient, the gas being received into the apparatus from an insufflator which receives gas from a gas source, and the gas exiting the apparatus being in flow communication with a means for delivering the gas to the interior of the patient, wherein the gas is pressure- and volumetric flow rate-controlled by the insufflator, comprising a housing having an inlet and an outlet; means for communicating the outlet of the insufflator with the inlet of the housing; a chamber within the housing and having an entry port and an exit port, the entry port of the chamber being in flow communication with the inlet of the housing; a humidification means in the chamber that is in the path of travel of the gas through the chamber; heating means disposed within the humidification means for heating the gas to a predetermined temperature; means in the housing adjacent the exit

port of the chamber for sensing the temperature of the gas; and means connected to the sensing means for controlling the heating means, whereby upon the determination by the sensing means of the temperature of the gas being at a predetermined level, the controlling means regulates the amount of heat applied by the heating means to the gas within the chamber. Additionally provided is a source of power for the controlling means. Also provided is the above apparatus wherein the source of power is a battery.

DEPR:

Once the insufflator 1 is activated, it receives gas from the gas supply cylinder and regulates the pressure and flow rate of the gas, both of which can be adjusted by the operator. Insufflator gas 21 then flows the full length of transfer tube 5 within lumen 15 where it enters heater/humidification chamber 6 at entry port 33, crosses optional gas permeable membrane 30 and enters enclosure 31, where it comes into contact with electrical heating element 20 and water-containing humidifying bed 28, shown in FIG. 2. The pressure and **volumetric** flow rate are controlled by adjusting the insufflator controls (not shown). In chamber 6, insufflator gas 21 is simultaneously heated and humidified to the proper physiological range by regulation of heater element 20 such that the temperature of gas 27 exiting chamber 6 is within a preselected physiological temperature range (preferably 36.degree. to 38.degree. C., through any desired temperature range can be preselected). The water-containing humidifying bed 28 provides humidification within chamber 6 such that gas 27 exiting chamber 6 is humidified. After the insufflator gas 21 has been temperature/humidity conditioned in chamber 6, it exits enclosure 31 (as gas 27) through optional gas permeable membrane 32, and enters chamber 7 where it passes through a high efficiency filter 25. The gas 27

then exits  
chamber 7 through exit port 34 (as gas 29) and into connector 26,  
which can  
attach to a conventional gas delivery device 11 appropriate for  
the specific  
medical procedure for immediate delivery of gas 29 into patient  
10.

DEPR:

The apparatus of the present invention provides for heating and  
humidifying gas  
for use in a medical procedure, comprising a chamber having an  
entry port and  
an exit port; humidification means within the chamber that is in  
the path of  
travel of the gas through the chamber; and means disposed within  
the  
humidification means for heating the gas to a predetermined  
temperature. The  
humidification means can comprise a volume of water and have the  
heating means  
disposed within or around the water, as described above. The  
water can be  
contained within water-retaining material such as a  
borosilicate-type material,  
as described above. Additionally, a filtering means can be  
provided, by the  
humidification bed and/or by an additional filter within the  
chamber. Filter  
sizes are preferably as described above.

DEPR:

The present invention also provides a method of providing heated,  
humidified  
gas into a patient for an endoscopic procedure comprising the  
steps of  
directing pressure- and volumetric flow rate-controlled gas,  
received from an  
insufflator into a chamber having a means for heating the gas to  
a temperature  
within a predetermined range and a means for humidifying the gas  
and being  
disposed immediately adjacent to the patient, wherein the chamber  
is in flow  
communication with and immediately adjacent to a means for  
delivering the gas  
to the interior of the patient; sensing the temperature of the  
gas as it exits  
the chamber to determine if it is within the predetermined range;  
and actuating

the heating means if the temperature of the gas is without the predetermined range; humidifying the gas within the chamber; and flowing the gas into the delivering means such that the gas enters the patient humidified and having a temperature within 2.degree. C. of the predetermined temperature and thus providing the gas. The heating means and the humidifying means can heat and humidify the gas simultaneously. The gas can be filtered as described above, as the gas is heated and humidified and/or immediately after it is heated and humidified. The heating means can be controlled by a power source comprising a self-contained battery of voltage in the range of about 1.6-3.0 V. An even more preferable range is about 2.6-3.0 V.

CLPR:

1. An apparatus for treating gas prior to the use of the gas in a medical procedure involving a patient, the gas being received into the apparatus from an insufflator which receives gas from a gas source, and the gas exiting the apparatus being in flow communication with a means for delivering the gas to the interior of the patient, wherein the gas is pressure- and volumetric flow rate-controlled by the insufflator, comprising:

CLPR:

5. The apparatus of claim 1, wherein the humidification means comprises a volume of water in flow communication with the gas as it travels through the chamber and having the heating means disposed within or around the water.

CLPV:

a) directing pressure- and volumetric flow rate-controlled gas, received from an insufflator into a chamber having a means for heating the gas to a temperature within a predetermined range and a means for humidifying the gas and being disposed immediately adjacent to the patient, wherein the chamber is

in flow communication with and immediately adjacent to a means  
for delivering  
the gas to the interior of the patient;